produced by said at least one optical member, is effective to cancel the birefringence to be produced by said plurality of lenses.

REMARKS

Applicant requests favorable consideration and allowance of the subject application in view of the preceding amendments and the following remarks.

Claims 11-13, 15-17, 18, 20, 21 and 23-25 have been amended to define still more clearly what Applicant regards as his invention. Claims 11 and 18 are the only independent claims.

Independent Claim 11, as amended, is directed to a projection optical system that projects a pattern of a first object onto a second object. The projection optical system has plural lenses and at least one correcting element that corrects birefringence of the system.

Independent Claim 18 as amended is directed to projection exposure apparatus in which an illumination system illuminates a first object with light. A projection optical system projects a pattern of a first object illuminated with the light onto a second object. The projection optical system has plural lenses. At least one correcting element in the projection optical system corrects birefringence of the projection optical system.

This application is a continuation-in-part of Application No. 09/123,443 filed July 28, 1998. U.S. Patent No. 5,142,548 (Krasinski, et al.) cited with respect to Application No. 09/123,443 discloses an arrangement for broadband tuning and laser line narrowing using birefringent laser hosts in which a combination of a polarizing element, a tuning element and a birefringent compensator permits output of narrow bandwidth spectrally tuned laser light continuously over the total gain bandwidth of a lasing cavity of a birefringent lasing medium by rotating the lasing medium, tuning to desired wavelength, and adjusting the birefringent compensator to optimize output of laser light.

It is a feature of Claims 11 and 18 as amended that a birefringence correcting element is provided in a projection optical system to correct birefringence of the system. U.S. Patent No. 5,142,548 may teach a birefringence compensator. The birefringence compensator of Krasinski, et al. only functions to adjust the output of a laser medium that has birefringence. Krasinski, et al., however, is devoid of teaching or suggestion of any projection optical system having plural lenses. Absent disclosure of such an projection optical system with plural lenses, Krasinski, et al. fails in any manner to teach or suggest the feature of correcting birefringence of a projection optical

system having plural lenses of Claims 11 and 18. Accordingly, Claims 11 and 18 as amended are believed to be completely distinguished from Krasinski, et al. and are allowable thereover.

U.S. Patent No. 5,880,891 (Furter) cited with respect to Application No. 09/123,443 discloses a high-resolution high-apertured objective that includes an object plane, a first lens group, a second lens group downstream of the first lens group, a beam splitter downstream of the second lens group, a concave mirror and a third lens group. A system diaphragm (quarter-wave plate) is interposed between the beam splitter and the concave mirror. The arrangement defines an image plane and is configured to provide a predetermined reduction scale and image side numerical aperture.

Furter may show a projection exposure apparatus having a projection optical system with plural lenses and an interposed quarter-wave plate but is devoid of any teaching or suggestion of birefringence in the projection optical system or correction of such birefringence. Accordingly, it is believed that Claims 11 and 18, as amended, are completely distinguished from Furter and are allowable thereover.

Applicant submits that the features of Claims 11 through 26, as amended, are completely distinguished from the art cited

in the Information Disclosure Statement filed October 30, 2000 and are allowable thereover.

Favorable consideration and an early passage to issue are requested.

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Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE TO THE CLAIMS

11. (Amended) A projection optical system for projecting a pattern of a first object onto a second object, said projection optical system comprising:

a plurality of [optical elements] lenses; and

at least one correcting [means] element for correcting birefringence of said [optical elements] projection optical system.

12. (Amended) A projection optical system according to claim 11, wherein said correcting [means] element comprises at least one optical member having predetermined form birefringence.

13. (Amended) A projection optical system according to claim 12, wherein said at least one optical member is arranged so that a distribution, including a distribution of form birefringence produced by said at least one optical member, is effective to cancel the birefringence to be produced by said [optical elements] plurality of lenses.

15. (Amended) A projection optical system according to claim 14, wherein said grating is provided on the surface of at least one of said [optical element] lenses.

16. (Amended) A projection optical system according to claim 11, wherein said correcting [means] element comprises at least one optical member having a predetermined stress distribution.

17. (Amended) A projection optical system according to claim 16, wherein said at least one optical member is arranged so that a distribution, including a distribution of stresses produced by said at least one optical member, is effective to cancel the birefringence to be produced by said [optical elements] plurality of lenses.

18. (Amended) A projection exposure apparatus comprising:

an illumination system for illuminating a first object with light; and

a projection optical system for projecting a pattern of the first object illuminated with the light from said illumination system, onto a second object, said projection optical system having a plurality of lenses and at least one correcting element for correcting birefringence of said projection optical system.

20. (Amended) A projection exposure apparatus according to claim 18, wherein said at least one correcting [means] element comprises at least one optical member having predetermined form birefringence.

21. (Amended) A projection exposure apparatus according to claim 20, wherein said at least one optical member is arranged so that a distribution, including a distribution of form birefringence produced by said at least one optical member, is effective to cancel the birefringence to be produced by said [optical elements] plurality of lenses.

23. (Amended) A projection exposure apparatus according to claim 22, wherein said grating is provided on the surface of at least one of said [optical element] plurality of lenses.

24. (Amended) A projection exposure apparatus according to claim 18, wherein said at least one correcting [means] element comprises at least one optical member having a predetermined stress distribution.

25. (Amended) A projection exposure apparatus according to claim 24, wherein said at least one optical member is arranged

so that a distribution, including a distribution of stresses produced by said at least one optical member, is effective to cancel the birefringence to be produced by said [optical elements] plurality of lenses.